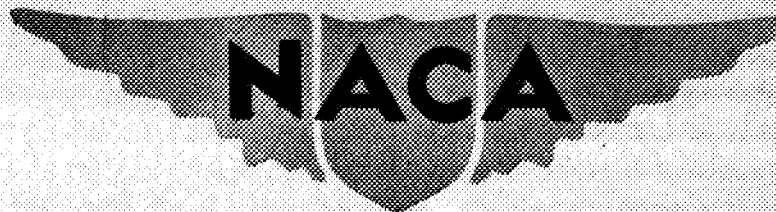


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RESEARCH MEMORANDUM

EVALUATION OF GUST AND DRAFT VELOCITIES FROM FLIGHTS OF

P-61C AIRPLANES WITHIN THUNDERSTORMS AUGUST 7, 1947

TO AUGUST 13, 1947 AT CLINTON COUNTY

ARMY AIR FIELD, OHIO

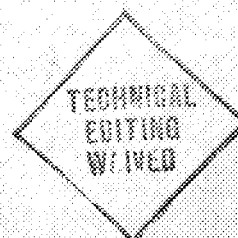
By

Jack Funk

Langley Memorial Aeronautical Laboratory
Langley Field, Va.

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESEARCH MEMORANDUM

EVALUATION OF GUST AND DRAFT VELOCITIES FROM FLIGHTS OF

P-61C AIRPLANES WITHIN THUNDERSTORMS AUGUST 7, 1947

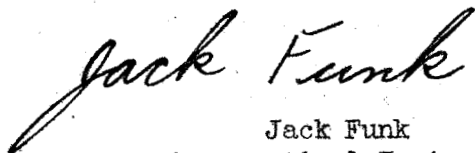
TO AUGUST 13, 1947 AT CLINTON COUNTY

ARMY AIR FIELD, OHIO

By Jack Funk

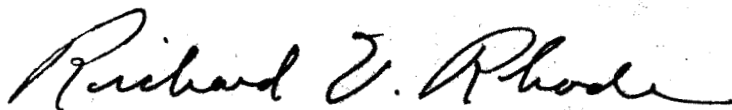
The results obtained from measurements of gust and draft velocities within thunderstorms at Clinton County Army Air Field, Ohio, for the period of August 7, 1947 to August 13, 1947 are presented herein. These data are summarized in tables I and II, respectively, and are of the type presented in reference 1 for previous flights.

Langley Memorial Aeronautical Laboratory
National Advisory Committee for Aeronautics
Langley Field, Va.



Jack Funk
Aeronautical Engineer

Approved:



Richard V. Rhode
Chief of Aircraft Loads Division

RCM

REFERENCE

1. Tolefson, H. B.: Evaluation of Gust and Draft Velocities from Flights of P-61C Airplanes within Thunderstorms May 13, 1947 to May 29, 1947, at Clinton County Army Air Field, Ohio. NACA RM No. L7J29, 1947.

TABLE I.- SUMMARY OF GUST MEASUREMENTS FROM FLIGHTS
OF P-61C AIRPLANES WITHIN THUNDERSTORMS

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 7, 1947 - Flight 19					
Airplane 353 - Traverse 1 Length of traverse 126.2 sec, 41,096 ft					
0 - 10	15,500	----	16.1	97	1
^a 10 - 20	15,000	----	----	---	0
20 - 50		----	----	---	0
50 - 60		8.0	----	---	1
60 - 70		----	----	---	0
70 - 80		5.5	----	---	2
80 - 90		10.3	----	---	2
90 - 100		10.6	18.3	---	5
100 - 110		----	----	---	0
^b 110 - 120		----	----	---	0
120 - 130		----	----	---	0
Airplane 353 - Traverse 2 Length of traverse 256.2 sec, 76,028 ft					
0 - 40	15,500	----	----	---	0
^a 40 - 50		----	----	---	0
50 - 60	15,000	7.7	8.3	---	3
60 - 70		14.4	7.7	---	5
70 - 80		----	3.5	15.6	3
80 - 110		----	----	---	0
110 - 130	15,500	----	----	---	0
130 - 160	15,000	----	----	---	0
^b 160 - 170		----	----	---	0
170 - 180		----	----	---	0
180 - 190		2.2	6.6	64	1
190 - 220		----	----	---	0
220 - 230		4.2	7.8	69	1
230 - 260		----	----	---	0

^aCloud entry.

^bCloud exit.

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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
August 7, 1947 - Flight 19								
Airplane 353 - Traverse 3 Length of traverse 188.3 sec, 55,215 ft								
0 - 10	16,000	----	----	----	----	----	----	0
10 - 30	15,500	----	----	----	----	----	----	0
30 - 40	16,000	----	----	----	----	----	----	0
^a 40 - 50		----	----	----	----	----	----	0
50 - 90		----	----	----	----	----	----	0
90 - 100		2.9	-5.1	7.9	-9.2	118	97	2
100 - 110		9.6	-8.0	----	----	----	----	3
110 - 120		5.7	-12.8	----	----	----	----	3
120 - 130		4.5	----	----	----	----	----	2
130 - 140		----	-4.5	----	----	----	----	1
140 - 150		----	----	----	----	----	----	0
^b 150 - 160		----	----	----	----	----	----	0
160 - 190		----	----	----	----	----	----	0
Airplane 353 - Traverse 4 Length of traverse 76.6 sec, 23,142 ft								
0 - 10	15,500	----	----	----	----	----	----	0
^a 10 - 20		----	----	----	----	----	----	0
20 - 80		----	----	----	----	----	----	0
Airplane 353 - Traverse 5 Length of traverse 214.3 sec, 64,503 ft								
0 - 10	15,500	----	-4.1	----	----	----	----	2
10 - 20		----	----	----	----	----	----	0
^a 20 - 30	15,000	4.8	----	7.9	----	42	----	1
30 - 100		----	----	----	----	----	----	0
100 - 110		4.1	----	11.7	----	113	----	1
110 - 120		----	-5.7	----	----	----	----	1
120 - 170		----	----	----	----	----	----	0
170 - 180		----	-7.0	----	----	----	----	1
^b 180 - 190	14,500	----	-7.0	----	----	----	----	2
190 - 200		2.5	----	5.8	----	45	----	1
200 - 220		----	----	----	----	----	----	0

^aCloud entry.^bCloud exit.NATIONAL ADVISORY
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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 7, 1947 - Flight 19					
Airplane 353 - Traverse 6 Length of traverse 263.6 sec, 80,447 ft					
0 - 10	14,000	----	----	----	0
10 - 40	14,500	----	----	----	0
^a 40 - 50		----	----	----	0
50 - 70		----	----	----	0
70 - 80		----	-5.0	-7.5	148
80 - 160		----	----	----	0
160 - 170		3.5	-6.0	----	2
170 - 180		----	-4.4	----	2
180 - 190		5.0	-3.8	----	3
190 - 220		----	----	----	0
220 - 230		----	-3.8	----	1
^b 230 - 240		3.2	----	----	2
240 - 270		----	----	----	0
Airplane 353 - Traverse 7 Length of traverse 108.1 sec, 31,736 ft					
0 - 20	14,000	----	----	----	0
20 - 30		----	-4.7	----	1
30 - 40		4.4	----	----	1
40 - 110		----	----	----	0
Airplane 353 - Traverse 8 Length of traverse 291.4 sec, 87,864 ft					
0 - 70	13,500	----	----	----	0
70 - 110	14,000	----	----	----	0
^a 110 - 120		----	----	----	0
120 - 180		----	----	----	0
180 - 230	13,500	----	----	----	0
230 - 240		----	-4.7	-7.0	132
240 - 250		4.7	8.3	88	1
250 - 260		----	----	----	0
260 - 270		6.3	-5.6	----	3
270 - 280		----	-7.8	----	1
^b 280 - 290		----	----	----	0
290 - 300		----	----	----	0

^aCloud entry.^bCloud exit.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
August 7, 1947 - Flight 19								
Airplane 333 - Traverse 1 Length of traverse 236.1 sec, 55,259 ft								
0 - 50	1,500	----	----	----	----	----	----	0
50 - 60		4.0	-3.3	7.1	----	109	----	5
60 - 70		5.4	-2.4	----	----	----	----	2
70 - 90		----	----	----	----	----	----	0
90 - 100		----	-3.6	----	----	----	----	1
100 - 110		2.2	----	4.4	----	117	----	1
110 - 240		----	----	----	----	----	----	0
Airplane 333 - Traverse 2 Length of traverse 238.9 sec, 59,943 ft								
0 - 110	2,000	----	----	----	----	----	----	0
110 - 120		----	-2.4	----	-4.7	----	117	1
120 - 130		----	----	----	----	----	----	0
130 - 140		3.8	-3.3	----	----	----	----	2
140 - 150	1,500	7.9	-7.9	----	----	----	----	5
^a 150 - 160		4.2	-4.9	4.1	----	88	----	4
160 - 170		5.7	----	----	----	----	----	2
170 - 180		5.6	-5.2	----	----	----	----	7
180 - 190		6.7	-2.3	----	----	----	----	3
190 - 240		----	----	----	----	----	----	0
Airplane 333 - Traverse 3 Length of traverse 255.2 sec, 67,116 ft								
0 - 80	3,500	----	----	----	----	----	----	0
80 - 90		4.4	----	8.0	----	194	----	1
90 - 100		2.9	-3.1	----	-3.7	----	88	2
100 - 110		6.2	-2.4	----	----	----	----	2
110 - 120	3,000	8.4	-1.8	----	----	----	----	4
120 - 130		5.2	-6.2	----	----	----	----	3
^a 130 - 140		6.6	-4.6	----	-8.1	----	101	3
140 - 150		----	-2.3	----	----	----	----	1

^aCloud entry.NATIONAL ADVISORY
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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 7, 1947 - Flight 19					
Airplane 333 - Traverse 3 Length of traverse 255.2 sec, 67,116 ft					
150 - 160	3,000	3.6	-----	-----	1
160 - 170		2.1	-5.5	-----	2 ^c
170 - 180		7.5	-3.1	-----	2
180 - 200		-----	-----	-----	0
200 - 250	2,500	-----	-----	-----	0
^b 250 - 260		-----	-----	-----	0
Airplane 333 - Traverse 4 Length of traverse 221.4 sec, 57,619 ft					
^c 0 - 120	3,500	-----	-----	-----	0
120 - 130		-----	-2.4	-----	1
130 - 140		-----	-4.7	-----	1
140 - 150		5.3	-----	-----	1
150 - 160		-----	-----	-----	0
160 - 170		-----	-1.9	-----	3
170 - 180		7.1	-----	6.4	2
180 - 190		-----	-2.2	-----	1
190 - 200		-----	-1.7	-----	1
200 - 210		-----	-----	-----	0
^b 210 - 220		-----	-----	-----	0
220 - 230		-----	-----	-----	0
Airplane 333 - Traverse 5 Length of traverse 171.1 sec, 43,296 ft					
^c 0 - 170	2,500	-----	-----	-----	0
^b 170 - 180		-----	-----	-----	0

^bCloud exit.^cCloud entry light on at beginning of traverse.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 12, 1947 - Flight 20					
Airplane 351 15,000 ft					
(e)					
Airplane 353 - Traverse 1 Length of traverse 65.4 sec, 18,733 ft					
0 - 20	9,000	----	----	----	0
20 - 30		4.9	-7.2	----	2
^a 30 - 40		6.2	-7.9	----	5
40 - 50		----	-7.9	----	3
50 - 60		9.9	-11.2	9.2	8
^b 60 - 70		----	----	----	0
Airplane 353 - Traverse 2 Length of traverse 35.6 sec, 10,097 ft					
0 - 10	9,000	7.1	-5.5	----	7
^a 10 - 20		6.7	-7.1	----	5
20 - 30		8.1	-6.9	----	4
^b 30 - 40		10.6	----	----	1
Airplane 353 - Traverse 3 Length of traverse 21.4 sec, 5,628 ft					
0 - 30	9,000	----	----	----	0
Airplane 353 - Traverse 4 Length of traverse 18.4 sec, 4,839 ft					
0 - 20	9,000	----	----	----	0
Airplane 353 - Traverse 5 Length of traverse 29.4 sec, 7,639 ft					
0 - 30	9,000	----	----	----	0

^aCloud entry.^bCloud exit.^cFailure in operation of airspeed-altitude recorder prevented computation of gust velocities for all traverses.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 12, 1947 - Flight 20					
Airplane 353 - Traverse 6 Length of traverse 292.4 sec, 81,240 ft					
0 - 130	9,500	----	----	----	0
^a 130 - 140	9,000	----	----	----	0
140 - 150		----	----	----	0
150 - 160		3.9	-3.7	----	4
160 - 170		7.1	-6.0	----	5
^b 170 - 180		----	-5.6	----	1
180 - 190	9,500	----	----	----	0
190 - 200		4.4	-4.0	----	4
200 - 210		----	----	----	0
210 - 220		----	-4.2	----	1
220 - 230		----	-9.4	----	1
^a 230 - 240		----	----	----	0
240 - 250	9,000	----	----	-4.3	42
250 - 270		----	----	----	0
^b 270 - 280		2.0	5.3	40	1
^a 280 - 290		----	----	----	0
^b 290 - 300		----	----	----	0
Airplane 353 - Traverse 7 Length of traverse 207.7 sec, 55,326 ft					
0 - 120	9,000	----	----	----	0
120 - 160	9,500	----	----	----	0
160 - 170		2.1	-4.8	5.1 -8.3	53 68
170 - 180		4.0	----	8.0	34
180 - 200		----	----	----	0
200 - 210		----	-4.5	----	1
Airplane 353 - Traverse 8 Length of traverse 98.0 sec, 28,548 ft					
0 - 30	9,000	----	----	----	0
^a 30 - 40		7.7	-9.6	16.0	115
40 - 50		13.5	-13.8	----	31
50 - 60		16.4	-11.2	----	7

^aCloud entry.^bCloud exit.NATIONAL ADVISORY
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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
August 12, 1947 - Flight 20								
Airplane 353 - Traverse 8 Length of traverse 98.0 sec, 28,548 ft								
60 - 70	9,500	13.7	-9.2	----	----	---	---	8
70 - 80		23.3	-----	-----	-----	---	---	2
80 - 90		----	-12.9	-----	-----	---	---	3
^b 90 - 100		----	-----	-----	-----	---	---	0
Airplane 353 - Traverse 9 Length of traverse 705.6 sec, 202,899 ft								
0 - 10	9,500	----	-----	-----	-----	---	---	0
^a 10 - 20		----	-----	-----	-----	---	---	0
20 - 50		----	-----	-----	-----	---	---	0
50 - 60		14.2	-----	7.3	-----	39	---	2
60 - 70		7.5	-13.3	-----	-----	---	---	8
70 - 90		----	-----	-----	-----	---	---	0
90 - 100		----	-4.7	-----	-----	---	---	1
100 - 110		3.6	-20.3	-----	-14.1	---	212	3
110 - 120		9.1	-13.3	-----	-----	---	---	7
120 - 130		9.1	-12.8	-----	-----	---	---	7
^b 130 - 140	9,000	5.3	-----	-----	-----	---	---	1
140 - 220		----	-----	-----	-----	---	---	0
220 - 230		8.8	-----	-----	-----	---	---	1
230 - 240		7.9	-4.2	7.2	-6.0	64	111	5
240 - 250		6.8	-4.7	-----	-----	---	---	2
250 - 260		----	-6.2	-----	-----	---	---	1
^a 260 - 270		----	-9.9	-----	-----	---	---	2
270 - 280		8.1	-4.4	-----	-----	---	---	6
280 - 290		4.0	-3.7	-----	-----	---	---	6
290 - 300		7.7	-9.5	-----	-----	---	---	5
300 - 310	9,500	5.6	-----	7.8	-----	42	---	1
310 - 330		----	-----	-----	-----	---	---	0
330 - 340		4.0	-2.9	-----	-----	---	---	3
340 - 350		----	-----	-----	-----	---	---	0
350 - 360		8.7	-11.9	10.5	-10.9	47	242	9
360 - 370		----	-9.0	-----	-----	---	---	1
370 - 380		3.3	-----	7.4	-----	180	---	1
380 - 390		----	-11.7	-----	-----	---	---	1
390 - 400		----	-----	-----	-----	---	---	0

^aCloud entry.^bCloud exit.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts		
August 12, 1947 - Flight 20							
Airplane 353 - Traverse 9 Length of traverse 705.6 sec, 202,899 ft							
b ₄₀₀ - 410	9,500	----	-----	-----	0		
410 - 550		----	-----	-----	0		
a ₅₅₀ - 560		----	-----	-----	0		
560 - 570		----	-----	-----	0		
570 - 580		----	-5.0	-----	121	1	
580 - 590		4.2	-2.5	-----	-5.1	197	2
590 - 600		----	-----	-----	-----	0	
b ₆₀₀ - 610		3.9	-----	-----	-----	1	
610 - 620		----	-----	-----	-----	0	
620 - 630		----	-4.4	-----	-5.0	58	1
a ₆₃₀ - 640		5.4	-6.0	-----	-----	3	
640 - 650		7.8	-13.4	-----	-----	6	
650 - 660		8.8	-5.1	-----	-----	4	
660 - 670		----	-6.4	-----	-----	1	
b ₆₇₀ - 680		----	-----	-----	-----	0	
680 - 710		----	-----	-----	-----	0	
Airplane 353 - Traverse 10 Length of traverse 65.8 sec, 18,847 ft							
0 - 10	9,000	----	-----	-----	0		
10 - 20		3.8	-4.5	-----	-----	3	
20 - 30		----	-4.5	-----	-6.6	127	2
a ₃₀ - 40		9.8	-8.0	-----	-----	4	
40 - 50		9.1	-14.0	-----	-----	5	
b ₅₀ - 60		4.0	-3.0	-----	-----	2	
60 - 70		----	-----	-----	-----	0	
Airplane 353 - Traverse 11 Length of traverse 817.8 sec, 237,316 ft							
0 - 30	9,500	----	-----	-----	0		
a ₃₀ - 40		4.6	-6.5	-----	-12.3	139	5
b ₄₀ - 50		4.7	-----	-----	-----	1	
50 - 60		----	-----	-----	-----	0	

aCloud entry.

bCloud exit.

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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e_{max}}$ (fps)	Maximum true gust velocity $U_{t_{max}}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 12, 1947 - Flight 20					
Airplane 353 - Traverse 11 Length of traverse 817.8 sec, 237,316 ft					
60 - 80	9,000	----	----	---	0
^a 80 - 90		----	-6.6	---	2
90 - 100		----	-10.9	---	5
100 - 110		15.1	-13.4	---	4
110 - 120		----	-7.6	---	2
^b 120 - 130		----	----	---	0
130 - 140		6.4	-8.2	10.5	201
140 - 190	9,500	----	----	---	3
190 - 200		5.4	-6.3	---	0
^a 200 - 210		10.0	-8.3	15.5	255
210 - 220		11.2	-10.6	---	7
^b 220 - 230		----	----	---	2
^a 230 - 240		----	----	---	0
240 - 250		7.8	-9.4	---	0
250 - 260		----	-5.4	-9.7	57
260 - 270		1.2	----	2.1	68
^b 270 - 280		----	----	---	3
280 - 330		----	----	---	1
^a 330 - 340		6.0	-8.0	-13.9	71
340 - 350		----	----	---	0
^b 350 - 360		----	----	---	0
360 - 390		----	----	---	0
390 - 400		----	-3.4	----	1
400 - 410	9,000	----	-2.7	----	1
410 - 440		----	----	---	0
440 - 450		----	-4.9	-8.0	182
450 - 460		7.1	----	7.4	33
460 - 480		----	----	---	2
^a 480 - 490		7.1	-7.3	----	0
^b 490 - 500		2.6	-4.1	6.5	76
500 - 570		----	----	---	4
570 - 620	9,500	----	----	---	2
^a 620 - 630		----	----	---	0
630 - 640	9,000	8.6	-4.9	4.6	74
^b 640 - 650		4.7	-4.1	6.2	52
650 - 660		----	----	---	3
					0

^aCloud entry.^bCloud exit.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 12, 1947 - Flight 20					
Airplane 353 - Traverse 11 Length of traverse 817.8 sec, 237,316 ft					
660 - 740	9,500	----	----	---	0
740 - 770	9,000	----	----	---	0
^a 770 - 780		----	----	---	0
780 - 790		12.3	-10.7	---	4
^b 790 - 800		----	----	---	0
800 - 820		----	----	---	0
Airplane 353 - Traverse 12 Length of traverse 76.0 sec, 22,431 ft					
0 - 10	9,000	2.5	-5.0	---	3
10 - 20		----	----	---	0
^a 20 - 30		8.9	-5.5	---	6
30 - 40	9,500	5.7	-5.9	---	6
40 - 50		7.8	-7.8	---	5
50 - 60	10,000	7.6	-6.8	---	3
60 - 70		----	-4.3	---	1
^b 70 - 80		----	----	---	0
Airplane 353 - Traverse 13 Length of traverse 33.5 sec, 99,020 ft					
0 - 10	9,500	----	-4.3	----	1
10 - 20		----	----	----	0
^a 20 - 30		6.9	-5.0	----	5
30 - 40		3.7	----	5.7	1
40 - 50		10.2	-7.9	----	4
50 - 60		7.2	-13.6	----	5
60 - 70		6.4	-10.8	----	4
^b 70 - 80		----	-3.2	----	1
80 - 90		7.6	----	----	3
90 - 100		----	-2.7	----	1
100 - 110		----	----	----	0
110 - 130	9,000	----	----	----	0
130 - 140	9,500	----	----	----	0

^aCloud entry.^bCloud exit.NATIONAL ADVISORY
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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 12, 1947 - Flight 20					
Airplane 353 - Traverse 13					
Length of traverse 33.5 sec, 99,020 ft					
140 - 150	9,500	3.9	-----	-----	2
150 - 160		7.6	-----	9.4	2
160 - 170		10.8	-----	12.3	1
170 - 220		-----	-----	-----	0
220 - 230		-----	-5.4	-----	1
^a 230 - 240		7.2	-6.5	-----	6
^b 240 - 250		-----	-8.4	-----	2
250 - 260		6.7	-----	11.1	2
^a 260 - 270		11.4	-7.6	-----	8
270 - 280		9.6	-10.7	-----	5
280 - 290		3.7	-2.7	-----	4
290 - 300		-----	-4.3	-----	1
^b 300 - 310		-----	-----	-----	0
310 - 340		-----	-----	-----	0
Airplane 344					
6,000 ft					
(d)					
August 12, 1947 - Flight 21					
Airplane 344					
10,000 ft					
(d)					
Airplane 333					
10,000 ft					
(d)					
August 13, 1947 - Flight 22					
Airplane 351					
25,000 ft					
(e)					

^aCloud entry.^bCloud exit.^dFailure in operation of accelerometer prevented computation of gust velocities for all traverses.^eFailure in operation of airspeed-altitude recorder prevented computation of gust velocities for all traverses.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{e\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 13, 1947 - Flight 22					
Airplane 327 - Traverse 1 Length of traverse 800.8 sec - (f)					
0 - 140	9,500	----	----	----	0
140 - 150		----	-5.6	----	1
150 - 330		----	----	----	0
330 - 340		3.6	-3.1	----	2
340 - 370		----	----	----	0
370 - 380		2.8	----	8.1	141
380 - 440		----	----	----	0
440 - 450		----	-3.6	----	4.3
450 - 460		3.6	----	----	37
460 - 470		----	-2.3	----	3
470 - 480		----	-3.9	----	2
^a 480 - 490		----	----	----	1
490 - 500		----	----	-5.5	76
500 - 510		8.9	----	14.7	96
510 - 520		5.9	----	22.0	89
520 - 530		----	----	----	0
^b 530 - 540		3.6	----	----	1
540 - 660		----	----	----	0
660 - 670		----	-5.2	----	1
670 - 690		----	----	----	0
690 - 700		4.4	-5.5	----	4
700 - 710		5.2	-5.1	----	11.5
710 - 720		----	-3.8	----	60
720 - 730		1.6	-4.0	10.0	58
730 - 810		----	----	----	2
Airplane 327 - Traverse 2 Length of traverse 1317.8 sec - (f)					
0 - 10	9,500	----	----	----	0
10 - 20		----	-4.2	----	-9.0
20 - 30		----	----	----	199
					0

^aCloud entry.^bCloud exit.^fLength of traverse in feet not computed to expedite handling of data.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
August 13, 1947 - Flight 22								
Airplane 327 - Traverse 2								
Length of traverse 1317.8 sec - (f)								
30 - 40	9,500	----	-3.8	----	-6.1	---	132	1
40 - 60		----	----	----	----	---	---	0
60 - 70		----	-2.4	----	-5.5	---	97	1
70 - 90		----	----	----	----	---	---	0
90 - 100		2.9	----	8.4	----	58	---	1
100 - 110		----	-3.7	----	----	---	---	1
110 - 120		----	----	----	----	---	---	0
^a 120 - 130		5.4	----	11.8	----	25	---	2
130 - 140		----	-6.1	----	-9.9	---	56	1
140 - 150		3.0	-3.9	----	----	---	---	5
150 - 160		----	-3.7	----	----	---	---	1
160 - 170		6.6	----	----	----	---	---	1
170 - 410		----	----	----	----	---	---	0
410 - 420		3.8	-5.8	----	----	---	---	3
420 - 430		----	-3.7	----	----	---	---	1
430 - 490		----	----	----	----	---	---	0
490 - 500		2.8	-4.1	6.6	-8.3	19	84	3
500 - 510		8.9	-5.5	9.6	----	46	---	6
510 - 520		----	-8.1	----	----	---	---	1
520 - 550	10,000	----	----	----	----	---	---	0
550 - 560		----	-3.7	----	----	---	---	1
560 - 570	9,500	----	----	----	----	---	---	0
570 - 580		1.4	----	6.2	----	69	---	1
580 - 590		3.6	-4.8	9.4	-8.2	215	283	3
590 - 600		----	----	----	----	---	---	0
600 - 610		4.3	----	7.0	----	178	---	2
610 - 620		2.7	-5.3	7.9	-3.6	132	163	2
620 - 630		5.7	----	----	----	---	---	1
630 - 640		----	-5.7	----	----	---	---	1
640 - 690		----	----	----	----	---	---	0
^b 690 - 700		----	----	----	----	---	---	0
700 - 800		----	----	----	----	---	---	0
800 - 810		5.0	-4.9	----	----	---	---	3
810 - 830		----	----	----	----	---	---	0

^aCloud entry.^bCloud exit.^fLength of traverse in feet not computed to expedite handling of data.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts		
August 13, 1947 - Flight 22							
Airplane 327 - Traverse 2 Length of traverse 1317.8 sec - (f)							
830 - 840	9,500	3.7	-----	-----	-----	1	
840 - 940		-----	-----	-----	-----	0	
940 - 950		3.7	-3.7	-----	-----	4	
950 - 980		-----	-----	-----	-----	0	
^a 980 - 990		-----	-----	-----	-----	0	
990 - 1020		-----	-----	-----	-----	0	
1020 - 1030		4.3	-----	7.6	73	2	
1030 - 1040		-----	-4.1	-----	-6.2	30	1
1040 - 1060		-----	-----	-----	-----	-----	0
1060 - 1070		-----	-2.9	-----	-5.8	75	1
1070 - 1120		-----	-----	-----	-----	-----	0
1120 - 1130		8.2	-5.9	-----	-----	-----	8
1130 - 1140		4.6	-11.6	-----	-----	-----	2
1140 - 1150		6.2	-4.4	-----	-----	-----	2
1150 - 1160		3.7	-6.5	-----	-----	-----	5
1160 - 1170		4.8	-4.1	-----	-----	-----	3
1170 - 1180		2.7	-4.9	-----	-7.9	177	3
1180 - 1190		4.9	-----	10.3	239	-----	1
1190 - 1220		-----	-----	-----	-----	-----	0
1220 - 1230		-----	-----	5.7	103	-----	1
1230 - 1250		-----	-----	-----	-----	-----	0
1250 - 1260		6.3	-----	-----	-----	-----	1
1260 - 1280		-----	-----	-----	-----	-----	0
^b 1280 - 1290		-----	-----	-----	-----	-----	0
1290 - 1320		-----	-----	-----	-----	-----	0
Airplane 327 - Traverse 3 Length of traverse 948.8 sec - (f)							
0 - 80	9,500	-----	-----	-----	-----	0	
^a 80 - 90		-----	-----	-----	-----	0	
90 - 110		-----	-----	-----	-----	0	
110 - 120		4.8	-5.2	4.7	73	4	
120 - 130		4.3	-5.2	-----	-----	4	
130 - 140		4.8	-----	-----	-----	1	

^aCloud entry.^bCloud exit.^fLength of traverse in feet not computed to expedite handling of data.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 13, 1947 - Flight 22					
Airplane 327 - Traverse 3 Length of traverse 948.8 sec - (r)					
140 - 150	9,500	----	----	----	0
150 - 160		----	-3.5	----	2
160 - 170		4.8	-3.5	8.0	2
170 - 180		2.2	-5.5	----	3
180 - 190		----	----	----	0
190 - 200		1.4	-3.5	6.0	2
200 - 270		----	----	----	0
270 - 280		4.7	-6.5	----	6
280 - 290		----	----	----	0
290 - 300		11.6	-8.1	----	6
300 - 310	10,000	9.6	-10.0	----	7
310 - 320		14.6	-12.6	----	9
320 - 330		7.5	-11.5	----	7
330 - 340		8.6	-5.3	----	3
340 - 370		----	----	----	0
^b 370 - 380		----	----	----	0
380 - 470		----	----	----	0
470 - 480		----	-4.6	----	1
480 - 490		4.7	----	9.8	2
490 - 500		9.5	-8.7	----	6
500 - 520		----	----	----	0
520 - 530		8.8	-11.8	7.2	9
530 - 540		13.7	-9.3	----	11
540 - 550		16.6	-5.9	----	8
550 - 560		13.2	-25.6	----	7
560 - 640		----	----	----	0
640 - 650		7.9	----	----	1
650 - 660		4.7	-5.9	----	6
^a 660 - 670		8.3	-10.2	----	9
^b 670 - 680		8.2	-7.3	----	3
680 - 690		2.6	----	----	1
690 - 710		----	----	----	0
710 - 720		3.5	-9.1	----	4

^aCloud entry.^bCloud exit.^fLength of traverse in feet not computed to expedite handling of data.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
August 13, 1947 - Flight 22								
Airplane 327 - Traverse 3 Length of traverse 948.8 sec - (f)								
720 - 730	10,000	----	-2.9	----	-----	---	---	1
730 - 740	9,500	3.3	-----	----	-----	---	---	1
740 - 750		3.4	-3.3	----	-----	---	---	2
750 - 760		4.1	-3.9	----	-----	---	---	6
760 - 810		-----	-----	----	-----	---	---	0
810 - 820		5.3	-----	9.4	-----	140	---	2
820 - 870		-----	-----	----	-----	---	---	0
870 - 880		-----	-3.4	----	-4.7	---	111	1
880 - 920		-----	-----	----	-----	---	---	0
920 - 930		-----	-2.6	----	-5.1	---	183	1
930 - 950		-----	-----	----	-----	---	---	0
Airplane 333 - Traverse 1 Length of traverse 558.2 sec, 148,846 ft								
0 - 200	5,500	(g)						
200 - 210		----	-----	----	-----	---	---	0
210 - 220		----	-4.1	----	-4.2	---	81	1
220 - 300		----	-----	----	-----	---	---	0
300 - 310		1.9	-----	3.0	-----	96	---	1
310 - 320		----	-----	----	-----	---	---	0
320 - 330		6.1	-----	10.3	-----	32	---	1
330 - 340		3.2	-----	4.9	-----	136	---	1
340 - 360		----	-----	----	-----	---	---	0
360 - 370		----	-3.2	----	-----	---	---	1
370 - 380		----	-----	5.6	-----	82	---	1
380 - 410		----	-----	----	-----	---	---	0
410 - 420		2.2	-----	3.5	-----	200	---	2
420 - 430		----	-----	----	-----	---	---	0

^fLength of traverse in feet not computed to expedite handling of data.
^gAccelerometer inoperative for first 198 sec of traverse.

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TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
August 13, 1947 - Flight 22								
Airplane 333 - Traverse 1 Length of traverse 558.2 sec, 148,846 ft								
430 - 440	5,500	----	-6.7	----	----	----	----	1
440 - 460		----	-----	----	----	----	0	
460 - 470		3.5	----	----	----	----	2	
^b 470 - 480		----	-----	----	----	----	0	
480 - 560		----	-----	----	----	----	0	
Airplane 333 - Traverse 2 Length of traverse 672.5 sec, 178,145 ft								
0 - 200	5,000	(h)	----	----	----	----	----	0
200 - 240	5,000	----	-----	----	-----	----	----	1
240 - 250		----	-----	----	-5.1	218	----	0
250 - 290		----	-----	----	----	----	----	2
290 - 300		3.5	-----	4.3	----	145	----	1
300 - 310		----	-3.2	----	-5.9	112	----	0
310 - 370		----	-----	----	----	----	----	2
370 - 380		----	-2.2	----	-3.4	130	----	0
380 - 420		----	-----	----	----	----	----	1
420 - 430		----	-2.5	----	----	----	----	0
430 - 440		----	-----	----	----	----	----	1
440 - 450		5.4	-----	10.8	----	121	----	0
450 - 460		----	-----	----	----	----	----	3
460 - 470		5.1	-----	7.9	----	113	----	3
470 - 480		----	-4.7	----	----	----	----	1
480 - 490		4.4	-----	----	----	----	----	8
490 - 500		4.4	-3.8	----	----	----	----	2
500 - 510		3.8	-4.7	4.8	----	50	----	3
510 - 520		----	-4.4	----	----	----	----	3
520 - 530		----	-11.0	----	----	----	----	5
530 - 540		9.2	-5.7	----	----	----	----	

^bCloud exit.^hAccelerometer inoperative for first 193 sec. of traverse.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts
August 13, 1947 - Flight 22					
Airplane 333 - Traverse 2 Length of traverse 672.5 sec, 178,145 ft					
540 - 550	4,500	7.3	-5.4	----	4
550 - 560		5.1	-----	-----	1
560 - 630	5,000	-----	-----	-----	0
^b 630 - 640		4.7	-----	153	2
640 - 680		-----	-----	-----	0
Airplane 333 - Traverse 3 Length of traverse 417.0 sec, 119,200 ft					
0 - 240	4,500	(1)			
240 - 250		4.4	-----	-----	1
250 - 260		-----	-4.1	-----	1
260 - 270		3.1	-1.9	-----	3
270 - 280		-----	-3.5	-----	2
280 - 300		-----	-----	-----	0
300 - 310		-----	4.3	-----	1
310 - 330		-----	-----	-----	0
330 - 340		2.5	-----	47	1
^b 340 - 350		-----	-----	-----	0
350 - 360		-----	-----	-----	0
360 - 370		2.8	-2.8	-----	3
370 - 380		2.5	-----	109	1
380 - 420		-----	-----	-----	0
Airplane 333 - Traverse 4 Length of traverse 602.1 sec, 169,628 ft					
0 - 250	5,500	(j)			
^a 250 - 260		4.7	-----	-----	1
260 - 270		5.9	-7.8	7.4	4
270 - 280		6.6	-3.4	6.6	6

^aCloud entry.^bCloud exit.ⁱAccelerometer inoperative for first 246 sec of traverse.^jAccelerometer inoperative for first 255 sec of traverse.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Continued

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)		Maximum true gust velocity $U_{t\max}$ (fps)		Gust gradient distance (ft)		No. of gusts
August 13, 1947 - Flight 22								
Airplane 333 - Traverse 4 Length of traverse 602.1 sec, 169,628 ft								
280 - 290	5,500	3.7	-5.9	----	-5.3	---	121	4
290 - 300		3.1	-2.2	----	----	---	---	2
300 - 310		----	----	----	----	---	---	0
310 - 320		3.4	-2.2	----	----	---	---	3
320 - 370		----	----	----	----	---	---	0
370 - 380		4.4	----	----	----	---	---	1
380 - 390		5.9	-5.9	----	----	---	---	6
390 - 400		6.2	-7.5	----	----	---	---	4
400 - 410		8.7	-7.2	----	----	---	---	4
410 - 420		4.1	-7.2	7.1	----	51	---	4
420 - 430		3.4	-4.4	5.4	----	96	---	4
430 - 440		4.7	-3.4	----	-5.8	---	99	4
440 - 450		4.1	-4.4	----	----	---	---	4
450 - 460		5.6	-5.0	----	----	---	---	3
460 - 470		5.6	-7.8	----	----	---	---	3
470 - 480		5.3	-2.8	----	-3.8	---	55	2
480 - 490		----	----	----	----	---	---	0
490 - 500		10.3	-3.4	17.8	-3.4	138	132	3
500 - 510		8.1	-6.2	----	----	---	---	3
510 - 530		----	----	----	----	---	---	0
530 - 540		----	-6.9	----	----	---	---	1
540 - 550		5.0	-3.7	----	-6.1	---	262	2
550 - 560		5.6	-2.2	8.5	----	57	---	5
560 - 570		3.7	-3.7	----	----	---	---	3
570 - 580		3.1	-2.8	----	----	---	---	2
580 - 600		----	----	----	----	---	---	0
^b 600 - 610		----	----	----	----	---	---	0
Airplane 333 - Traverse 5 Length of traverse 347.2 sec, 96,221 ft								
0 - 110	5,500	(k)						
110 - 120		4.0	-3.7	----	----	---	---	2
120 - 130		5.0	----	----	----	---	---	2
130 - 140		3.4	----	----	----	---	---	1

^bCloud exit.^kAccelerometer inoperative for first 115 sec of traverse.

TABLE I.- SUMMARY OF GUST MEASUREMENTS - Concluded

Time interval (sec)	Pressure altitude (ft)	Maximum effective gust velocity $U_{e\max}$ (fps)	Maximum true gust velocity $U_{t\max}$ (fps)	Gust gradient distance (ft)	No. of gusts			
August 13, 1947 - Flight 22								
Airplane 333 - Traverse 5 Length of traverse 347.2 sec, 96,221 ft								
140 - 150	5,500	3.7	-7.8	----	----	---	---	3
150 - 160		----	-3.1	----	-3.0	---	84	1
160 - 190		----	----	----	----	---	---	0
190 - 200		3.7	-2.8	5.8	-17.1	107	107	3
200 - 210		4.0	-2.8	3.9	----	103	---	3
210 - 220		5.0	-4.0	5.3	----	142	---	5
220 - 230		5.6	----	----	----	---	---	2
230 - 240		6.5	----	5.3	----	118	---	2
240 - 250		----	-4.3	----	----	---	---	1
250 - 260		----	----	----	----	---	---	0
260 - 270		----	-4.7	----	-10.5	---	128	1
270 - 280		----	-6.8	----	----	---	---	1
280 - 300		----	----	----	----	---	---	0
^b 300 - 310		----	----	----	----	---	---	0
310 - 350		----	----	----	----	---	---	0

^bCloud exit.NATIONAL ADVISORY
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TABLE II.- SUMMARY OF DRAFT VELOCITY MEASUREMENTS FROM FLIGHTS
OF P-61C AIRPLANES WITHIN THUNDERSTORMS

Date	Flight no.	Air- plane no.	Assigned altitude (ft)	Trav- erse no.	Draft location from start of traverse (sec)		Draft extent (ft)	Average draft velocity (fps)
					Start	End		
8-7-47	19	353	15,000	a ₁				
				a ₂				
				a ₃				
				a ₄				
				a ₅				
				a ₆				
				a ₇				
				a ₈				
		333	2,000 to 4,000	a ₁				
				2	125.5	184.0	14,776	-13.0
				3	126.5	199.0	19,015	-8.1
8-12-47	20	351	15,000	4	124.5	193.6	17,879	-6.8
				a ₅				
		353	10,000	(b)				
				a ₁				
				a ₂				
				a ₃				
				a ₄				

^aNo draft velocities indicated by records.

^bFailure in operation of airspeed-altitude recorder prevented computation of draft velocities for all traverses.

TABLE II.- SUMMARY OF DRAFT VELOCITY MEASUREMENTS - Continued

Date	Flight no.	Air-plane no.	Assigned altitude (ft)	Traverse no.	Draft location from start of traverse (sec)		Draft extent (ft)	Average draft velocity (fps)
					Start	End		
8-12-47	20	353	10,000	a ₅				
				a ₆				
				a ₇				
				8	55.0	72.5	5,048	31.4
				9	51.5	67.8	4,797	12.9
				a ₁₀				
				11	97.4	106.8	2,745	-22.6
				12	25.2	37.8	3,796	23.8
				a ₁₃				
		344	6,000	1	11.5	36.0	6,403	10.4
				a ₂				
				3	15.3	47.8	8,515	5.8
				a ₄				
				a ₅				
	21	344	10,000	a ₁				
				2	47.4	80.0	9,942	9.6
				3	56.5	77.2	6,467	42.8
				a ₄				
				a ₅				

^aNo draft velocities indicated by records.

TABLE II.- SUMMARY OF DRAFT VELOCITY MEASUREMENTS - Concluded

Date	Flight no.	Air-plane no.	Assigned altitude (ft)	Traverse no.	Draft location from start of traverse (sec)		Draft extent (ft)	Average draft velocity (fps)
					Start	End		
8-12-47	21	344	10,000	6	41.6	49.8	2,454	24.4
					174.6	194.0	5,703	7.7
					206.5	224.4	5,209	20.3
					247.8	275.6	8,637	18.9
				7	15.0	42.5	7,914	11.8
					63.4	105.9	13,069	10.6
		333	10,000	a ₈				
				1	62.0	123.7	18,983	12.6
				2	307.5	356.3	14,832	4.9
				a ₃				
				4	22.4	50.2	8,298	6.3
				5	87.0	112.2	7,686	7.4
8-13-47	22	351	25,000	(b)				
			10,000	a ₁				
		333	5,000	a ₂				
				a ₃				
				a ₁				
				a ₂				
				a ₃				
				a ₄				
				a ₅				

^aNo draft velocities indicated by records.

^bFailure in operation of airspeed-altitude recorder prevented computation of draft velocities for all traverses.

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ABSTRACT

The gust and draft velocities from records of NACA instruments installed in P-61C airplanes participating in thunderstorm flights at Clinton County Army Air Field, Ohio, from August 7, 1947 to August 13, 1947 are presented.